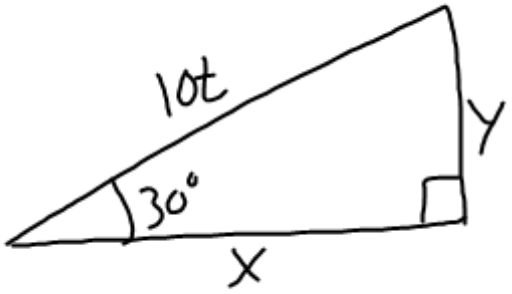
Concept: Wind/River Problems

Sect. 6.5

Rule: Any motion can be broken into (x) horz. + (y) vert. components. Put speed along with time along actual path then use cosθ & sinθ to find components



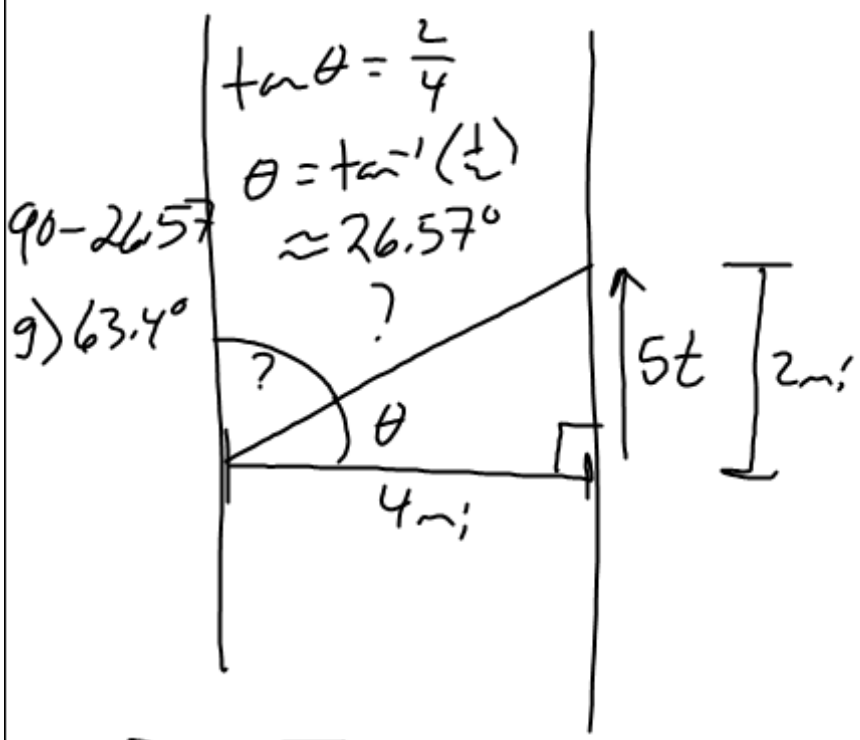
$$X = 10t\cos(30)$$

$$Y = 10t\sin(30)$$

If there is a wind, make components for that also.

Hints

- Picture, Equations, Time (P.E.T.)
- Distances usually plugged in for x & y
- $t = \frac{d}{r}$, $d = rt$, $r = \frac{d}{t}$



river

$x = 0$

$y = 5t$

$2 = 5t$

$t = 0.4$ hrs.

Fred

~~$x = 3t$~~

~~$y = 0$~~

$x = rt$

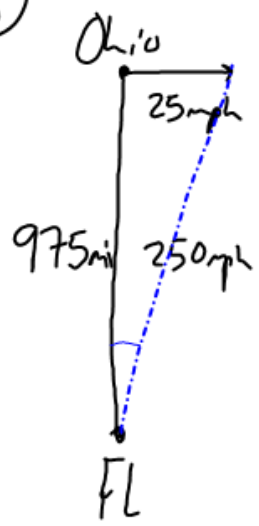
$4 = r(0.4)$

$r = 10$ mph

$\sqrt{4^2 + 2^2} = 4.47$ mi

$\frac{4.47}{0.4} \approx 11.175$ mph.

(5)



Picture

Plane	wind
$x = 0$	$x = 25t$
$y = 250t$	$y = 0$

$y = 250t$

$975 = 250t$

$t = 3.9$ hrs

time

Equations

(a) $x = 25(3.9)$

$x = 97.5$ miles east

(b) $\sqrt{(97.5)^2 + (975)^2} \approx 979.86$ miles

(c) $\frac{d}{t} = \frac{979.9}{3.9} = 251.25$ mph

(d) $\tan\theta = \frac{97.5}{975}$, $\theta = \tan^{-1}\left(\frac{97.5}{975}\right) = 5.71$

(e) heading $90 - 5.71 = 84.29°$

Gravity

$x = 0$

$y = -16t^2 + 50$

- y: height at time t
- -16: gravitational force
- t: time
- 50: initial height

Sect. 6.5

#6 – 9

drop from 5 ft – how long to hit ground?

$y = -16t^2 + 5$

$0 = -16t^2 + 5$

$-5 \qquad -5$

$\frac{-5}{-16} = \frac{-16t^2}{-16}$

$\sqrt{\frac{-5}{-16}} = \sqrt{t^2}$

$\sqrt{\frac{-5}{-16}} = t$

#6

Gravity

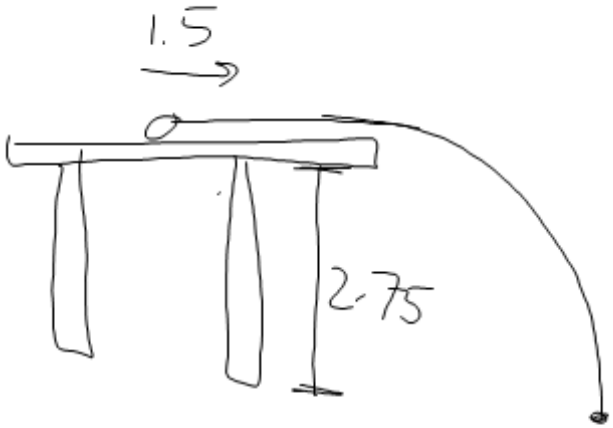
$x = 0$

$y = -16t^2 + 2.75$

Ball

$x = 1.5t$

$y = 0$



Overall

$x = 1.5t + 0$

$y = -16t^2 + 2.75 + 0$

time

$0 = -16t^2 + 2.75$